1,002,292

PATENT SPECIFICATION 1,002,292

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in or relating to Cartridge-Actuated Instruments for Inserting Bolts.

We, "IMPEX-ESSEN" VERTRIEB VON WERKZEUGEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, a German Company of Dürrnerstrasse 1, Ansbach/Mittelfranken, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an instrument for inserting bolts into fixed structures or receiving bodies, which is provided with a forward thrusting piston guided movably along the longitudinal axis of the barrel of the instrument by the combustion gases generated by the charge in a cartridge, the piston lying in its rear initial position with its front end adjacent to a bolt inserted into the muzzle of the instrument. In this way the bolt located in the muzzle of the instrument can be impelled into the receiving body by means of the piston situated adjacent to it being propelled by the combustion gases from the charge in the cartridge. The bolt is propelled with comparatively small velocity but with adequate thrust and with the greatest possible safety of operation.

In known bolt-inserting instruments according to the art, there is the disadvantage that the barrel guiding the piston is made dirty comparatively quickly by the burnt powder and other such residues from the propellant gases, so that the piston can only move in the barrel with great difficulty after only a comparatively short period of use. Moreover, the insertion of bolts by known instruments sometimes produces further difficulties, because the power of a spring acting on the piston must be overcome, and because this spring is endeavouring to push the piston forwards in the direction of the muzzle of the instrument. In addition to this problem, known bolt-inserting instruments of the type in question have further faults with regard to their construction and handling.

The present invention seeks to overcome these difficulties by providing a bolt-inserting instrument in which these difficulties are not present; an instrument which is much more simply constructed, and which can be handled easily under working conditions, as well as being safe from accidents.

An instrument for inserting bolts in accordance with the present invention comprises a piston which is movably guided within a barrel along the longitudinal axis of the instrument and which is arranged to be thrust forward by combustion gases produced by a cartridge, in which the forward end of the piston is arranged for contact with a bolt which is received into a muzzlepiece of the instrument and the rear end of the piston is provided with a pressure chamber into which a hollow prominent portion of a cartridge support which is mounted in the rear part of the barrel projects, and in which the cartridge support with its prominent portion is displaceable longitudinally

[*Price 4s. 6d.*]

relative to the muzzle-piece which is adapted to receive the bolt to be inserted.

This has the great advantage that, as the cartridge support is movable relative to the muzzle-piece, the bolt can be more easily inserted into the recess in the forward end of the piston, and can easily be ejected again if incorrectly inserted. In addition, such insertion and ejection of bolts does not require the removal of the cartridge first. There is also the advantage that the combustion of the charge in the cartridge is completely sealed in the pressure chamber at the rear end of the piston before the pressure chamber is opened by the forward movement of the piston, so that the combustion gases cannot make the barrel dirty and cannot form any clinging powder residues therein. The barrel no longer serves to impel the piston in this novel instrument in which a piston provides the motive power, but only acts as a guide.

According to a further feature of the invention, the cartridge support can be limited in its axial movement by a hollow nut arranged at the rear part of the barrel, and is pushed into its rear initial position in the hollow nut by means of the gas pressure generated in the pressure chamber, the cylindrical guideway for the piston in the barrel extending over a length of several piston diameters. It is preferable however, that the cartridge support should be fixed firmly to the rear part of the barrel, and that the barrel should be able to move longitudinally in the instrument casing as well as being under the influence of a spring which holds the barrel and the cartridge support in a rear firing position which is constant for any particular length of bolt. In this way, by means of the barrel being movable longitudinally in the instrument casing on account of the fact that the rear part of the instrument is able to be swung open, the barrel together with the piston and the bolt can be moved forward safely by manual pressure against the cartridge support, and thereby the inserted bolt can be ejected and, if desired, replaced by a new bolt. This is extremely advantageous for the convenient and safe handling of the bolt-inserting instrument. The spring which attempts to hold the barrel in the constant firing position provides a further advantage, in that on firing the cartridge, the barrel together with the cartridge support and the piston is moved forward through a small distance against the power of the spring, so that it is possible to transfer a forward impulse to the barrel thus reducing the recoil. The barrel is then pushed back again by the gas pressure pressure through a predetermined distance to its rear firing position. The small forward movement of the barrel on firing and the recoil movement are sufficient to insert the bolt, either completely or partially, before the instrument leaves the surface of the receiving member.

In order to be able to use bolts of different lengths, the muzzle-piece of the instrument can be axially adjusted in relation to the instrument casing. It is however quite possible to arranged the muzzle-piece to be fixed in the instrument casing, and in this case the instrument itself must be capable of being adjusted for different lengths of bolts. In these circumstances, the present invention provides for a muzzle cap to be fixed to the muzzle-piece, this muzzle cap having two prominent slotted jaws provided with lateral recesses. The bolt which is provided with a circular support is inserted and held between the slotted jaws. In this way, a long axial support region between the slotted jaws of the muzzle cap is provided to support the circular support of the bolt, so that bolts of correspondingly different dimensions can be inserted into the muzzle of the instrument without difficulty and can then be held therein.

In order to fire the cartridge, a sealing member of known type is provided in the rear part of the instrument which is connected to the front part of the instrument by a hinged joint. This sealing member is moved forward in spring fashion as a result of manual pressure on a casing grip on the rear part of the instrument through interconnection of a correspondingly dimensioned spring member. In this latter case, the bolt-inserting instrument is preferably provided with a safety catch which is locked by a tubular slide bar controlled by a spring. This slide bar is moved into its safe position as indicated by the safety catch by means of a bolt projecting forward to the muzzle cap when the instrument is pressed against the place of insertion.

A particularly advantageous embodiment of a bolt-inserting instrument according to the present invention has the following features. The barrel surrounding the piston has a limited axial movement in the front part of the casing and is connected to the sealing member by rotating the front part of the casing relative to the rear part of the casing connected to it by a hinged joint. The sealing member is provided with both a firing piston held in check by a blocking member, and a piston spring. This piston spring is stressed by placing the instrument against the place of insertion which causes a displacement of the muzzle-piece, the barrel and the sealing member relative to the parts of the casing connected to one another by the hinged joint. This ensures that a satisfactory link is made between both the parts of the casing connected to one another by means of the hinged joint, and also ensures an automatic tightening of the sealing mem-

ber or the firing means located therein, as well as providing a simple and safe means of manipulating the instrument. A barrel jacket connected to the muzzle-piece is preferably provided between the barrel and the front part of the casing, this barrel jacket having a limited axial movement in the front part of the casing and, in the same way as the barrel, being locked by the sealing member on rotation of the front part of the casing relative to the rear part of the casing.

In order that the invention may be more readily understood, several embodiments according to the invention will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is an axial longitudinal section through a first embodiment of a bolt-inserting instrument according to the invention;

Fig. 2 is a longitudinal section through a second embodiment according to the invention;

Fig. 3 is a longitudinal section through a third embodiment according to the invention;

Fig. 4 is a front end view of the embodiment illustrated in Fig. 3;

Fig. 5 is an external side view of the embodiment illustrated in Fig. 3;

Fig. 6 is an axial longitudinal section through a fourth, particularly advantageous, embodiment of the bolt-inserting instrument according to the invention;

Fig. 7 shows a front end view of the embodiment illustrated in Fig. 6 in the upper half; and a section taken along the line II—II of Fig. 6 in the lower half;

Fig. 8 is a section taken along the line III—III of Fig. 6;

Fig. 9 is a section taken along the line IV—IV of Fig. 6; and

Fig. 10 is an external view of the instrument according to Figs. 6—9, with the front part of the casing swung round into view.

In the bolt-inserting instrument shown in Fig. 1, a piston 2 is movably guided in a barrel 1 over a length of several piston diameters against the resistance of a friction spring 3. The front end 4 of the piston holds a bolt 5 to be inserted which is arranged within a movable casing 7 which, together with a circular muzzle cap 6 and the piston 2, forms the muzzle-piece. The movable casing 7 can be adjusted by means of a thread 8 on the barrel 1 corresponding to the length of the bolt. In the wall of the movable casing 7, there is provided a sighting slot (not shown) which facilitates the introduction of the bolt into the front end of the piston. The rear end of the piston is provided with a pressure chamber 10 into which a cylindrical hollow peg 12 forming part of a cartridge support 11 projects. The cartridge support 11 is also provided with a cartridge recess 13 which is connected with the pressure chamber 10 by a bore 14. The cartridge support 11 is axially movable relative to the barrel 1 and in a backward facing hollow nut 15 encircling a space 16. The hollow nut 15 is itself fixed firmly to the barrel 1.

By tilting the barrel about the pivot point 17 of a safety catch 18 the piston 2 can be pushed through the space 16 by means of manual pressure on the cartridge support 11, and an inserted bolt 5 can be ejected from the muzzle if it has not been used. The ignition of the charge in the cartridge can be carried out by known means, for example, by means of the forward thrust of a hollow cylinder 20 containing a recoil spring 19 and having a firing pin 21. As a result of the impact of the firing pin against the cartridge, indicated within a casing grip 22 and by its piston 23, the cartridge support 11 can move a small distance forward, depending upon the magnitude of the bolt-inserting resistance, before ignition takes place. After ignition the cartridge support 11 is thrown back through the same distance by means of the gas pressure in the pressure chamber 10, and is held by the hollow nut 15. In other words, the part of the end closure which is driven forward, i.e. the hollow cylinder 20, and which participates in the ignition, process against the base of the cartridge. The impulse is transmitted from the pressure chamber 10 to the piston 2 which then serves to insert the bolt 5. During the period when the bolt is being inserted the parts thrust forward by the ignition are thrown back by the gas pressure on the cartridge, and since the cartridge support 11 is held fast, the cartridge ejects itself. The ignited and expanding gases in the pressure chamber 10 flow through a channel 11^1 in the cartridge support 11 into the space behind the barrel, and from there into the open air.

In the bolt-inserting instrument illustrated in Fig. 2, a barrel 32 and a piston 33 are movable longitudinally in a casing 31. A muzzle-piece 34 is guided movably over the barrel 32 and can be adjusted and fixed in the casing 31 by means of a movable thread 35 depending on the length of the bolt. The muzzle-piece 34 is connected firmly to a muzzle cap 36 which is provided with a bore 37 through which the bolt 50 can pass. Between the muzzle-piece 34 and the barrel 32 lies a spring 38 which holds the barrel 32 in a constant rear firing position for each particular length of bolt. A cartridge support 39 is immovably fixed in the barrel 32, for example by means of circular bolts 39^1. The cartridge support 39 holds a cartridge body 40 which has a percussion cap 41 fitted behind it. The cartridge support 39 also has an integral hol-

low projection 42 which extends into a pressure chamber 44 of the piston 33 to a depth indicated by the arrow 43. Between the cartridge body 40 and the pressure chamber 44 lies a flow channel 45. In the barrel 32 there is provided a gas collecting space 46 which is connected to an expansion chamber 48 in the casing by a gas exhaust aperture 47. The gas then flows from the expansion chamber 48 into the open air through a channel 47*a*.

The piston 33 is provided with a friction ring 49 in frictional contact with the muzzle-piece 34 so that depending upon the forward movement of the barrel 32, which can be effected by opening or breaking the instrument, the piston 33 remains stationary in its forward position for the purpose of introducing a bolt 50 into a recess in the head 51 of the piston. By the introduction of the bolt 50 the piston 33 is displaced to its rear pre-ignition position.

The insertion of the cartridge follows after the rear part 54 of the instrument which includes the end closure elements has been hinged open by rotating it about the pivot point 52 of a safety catch 53. The ignition of the cartridge can be carried out by any known means. Thus, advantageous use can be made of the movable nature of the barrel 32 by projecting a firing block 55 having a firing pin forwards by hand or by a spring. The firing block can therefore be made correspondingly small, since the firing impulse acting on the barrel 32 or on the associated cartridge support 39 can be converted into kinetic energy of the barrel, whereas known bolt arrangements with rigidly arranged barrels must have correspondingly greater weights or dimensions in order to arrest the cartridge.

In the bolt-inserting instrument illustrated in Figs. 3—5, a barrel 62 is movably guided longitudinally in a casing 61 surrounded by a protecting cover 91. A muzzle-piece 64 is connected to the casing 61, for example by means of a screw-thread or bayonet connection 65. A muzzle cap 66 is firmly secured on the muzzle-piece, and is provided with two prominent slotted jaws 70 each having lateral recesses 69 for the purpose of loading and supporting a bolt 67 to be inserted and its circular support 68. Between the muzzle-piece 64 and the barrel 62 lies a spring 71 which holds the barrel 62 in its constant rear pre-ignition position for any bolt of a particular length. A cartridge support 72 receives a cartridge 73 having its head 74 pointing in a backward direction. A piston 63 for holding the bolt extends into a gas exhaust space 75 in the barrel 62 and has its long cylindrical shaft 76 lying within the muzzle-piece 64. By means of a friction spring 77, the piston 63 is movably held in the muzzle-piece 64 by frictional contact. The long length of the shaft 76 in the muzzle-piece prevents the piston from bending and lengthens its life, whereby the function of a pressure chamber or brake chamber 78 contained in the rear end of the piston into which the hollow projection of the cartridge support 72 extends is maintained.

On a pivot point 79 between the front part of the instrument and the rear part of the instrument, denoted by V and H respectively, is provided a casing safety catch 80 whose movement can be arrested by a tubular bolt 81, yet which is freed for movement by means of bolts 82 and 83 when the instrument is pressed against the place of insertion or against the receiving body. When the instrument is in the condition when it is not being used, the power of a spring 84 pushes the tubular bolt 81 under the safety catch 80. In order to fire the cartridge 73 a hammer 85 is withdrawn through a distance indicated by the arrow 86 after operation or opening of the safety catch 80 and this hammer pushes against the recoil spring 87 which moves the intermediate or impulsion member 88 and its firing pin forward and thus causes the ignition to take place. As a result of this the barrel 62 and the cartridge support 72 are moved forward by a small distance. This forward movement of the barrel with the piston 63 and the bolt 67 by the mechanical impulse due to the ignition has the advantage that the insertion of the bolt takes place before the recoil of the barrel 62 withdraws the casing from the place of insertion.

In the bolt-inserting instrument illustrated in Figs. 6—10, the instrument casing consists essentially of a front casing part provided with a muzzle-piece 101 and a guard tube 104, a rear casing part 119 and a casing grip 126. The front part 104 and the rear part 119 are bolted together by a bayonet connection 119^{1}. In addition to this, the afore-mentioned parts are connected to one another by a hinge joint which is formed from pegs 119^{11} arranged on each side of a prominent flange 119*a* of the rear part 119 of the casing. These pegs 119^{11} grip the back of a collar 104^{11} situated at the rear end of the front part 104 of the casing, which is provided with a slot 104^{111} wide enough to accommodate the flange 119*a* after breaking open the rear part 119 of the casing (Figs. 6 and 10). The slot 104^{111} for the flange 119*a* in the collar 104^{11} is so arranged that the flange can only swing through the slot 104^{111} in the open position of the bayonet connection 119^{1}.

In the front part 104 of the casing there is a barrel jacket 106 which is connected to the muzzle-piece 101 through the intermediary of a rivetted ring 103 and which is able to move within the limits defined by the edges 104^{1}, 106^{1} and 106^{11}. Therefore an

L-shaped guide-way or keyway 106*a* is provided on the barrel jacket 106 into which a guide bolt 109 situated in the front part 104 of the casing can be inserted. The keyway 106*a* makes a corresponding longitudinal movement of the barrel jacket 106 possible, and at the same time a corresponding rotary movement across its recessed groove part 106^{11111}, as can be seen most clearly in Figs. 6 and 8.

A hand guard 107 which consists of some suitable material such as a plastics material is attached to the front part 104 of the casing of the instrument. At the same time this hand guard 107 presses a ball 113 situated in the front part 104 of the casing into a groove 113^1 provided around the circumference of the barrel jacket 106. In this way the barrel jacket 106 can be arrested sufficiently in its rotary movement relative to the front part 104 of the casing in which the guide bolt 109 is also fitted near the edge 106^{11}.

The barrel 110 is not able to rotate in the barrel jacket 106 but is able to move longitudinally past a peg 112 projecting into a longitudinal groove 111 formed in the barrel surface. The barrel 110 is biased against the edge 106^{111} of the barrel jacket 106 by means of the pressure of a spring 105. A cartridge support 114 is firmly connected to the barrel 110 by means of a pin 120. A bolt-carrying piston 108 can move longitudinally within the barrel 110. The piston has a space 108^1 serving as a pressure chamber at its rear end, into which a hollow projection 114^1 of the cartridge support 114 projects. A sealing member 125 is fixed to the rear of the barrel 110 by means of a screw-thread connection 125^1. In the sealing member 125 are contained an impulse block 121, a percussion bolt 122 and a screw 124 for limiting the movement of the percussion bolt. The impulse block 121 is held firmly in the sealing member 125 by means of a pin 123. Moreover, a blocking member 131 having a blocking member spring 130 is laterally arranged within the sealing member 125. The blocking member 131 is held, after the introduction of the sealing member 125 into the rear part of the casing 119, by means of the spring 130 and the edge 119^{111} (Fig. 7) in a position so as to obstruct the passage of an ignition piston 135 through a channel 131^1 formed through the blocking member. The ignition piston 135 is provided with a piston spring 133, a guiding plate 138, a safety ring 139 and an outer spring 132 in the rear part 119 of the casing. A safety catch 128 is provided in the casing grip 126 which is fitted on the rear part 119 or tube of the casing, and which is secured thereto by means of an inset peg 134. The safety catch 128 is held by the action of a pressure spring 129 and is also held by rubber rings 127, 127^1.

By rotating the rear part 119 of the casing relative to the front part 104 of the casing in an anti-clockwise direction as viewed from the rear of the instrument, the flange 119*a* can be rotated as far as an inset peg 116 which forms an abutment stop and which is shown displaced through 90° in Fig. 6 from its position as shown in Fig. 9. A peg 117 formed transversely through the rear casing 119 slides at first in a transverse groove 106^{11} which is shorter in length than transverse groove 106^{11111}, whereby the bayonet connection 119^1 between the front and rear parts of the casing and the bayonet connection 125^1 between the barrel 110 and the sealing member 125 can be released. The barrel jacket 106 is consequently rotated so that groove 106^{11111} and the guiding bolt 109 impede any longitudinal movement of the barrel jacket 106 in the front part 104 of the casing. The rear part of the instrument is pulled backwards into locking engagement until pegs 119^{11} arranged on both sides of the prominent flange 119*a* of the tubular casing 119 strike against the collar 104^{11}, after which the rear part of the instrument with its flange 119*a* can be swung open relative to the front part by means of the slot 104^{111} formed therein.

In order that a bolt 100 which is to be inserted may be conveniently introduced into a receiving aperture 108^1 in the front end of the piston, the barrel 110, and consequently the piston 108, is pushed forward with the thumb. While the piston 108 is held in frictional contact by means of a clamping pin or a clamping tube 102 which is arranged in an axial channel 102^1 in the muzzle-piece 101 and which projects partially into the bore 101^1 used for introducing the bolt, the barrel 110 is thrown back again into its rear position by means of the pressure generated when spring 105 is released. The bolt 100 is then inserted into the receiving aperture 108^1 of the piston 108 and is pushed into the instrument to such a distance that the piston 108 is pushed over the prominent hollow peg 114^1 of the cartridge support 114 and surrounds it. In order to facilitate the introduction of the bolt 100 the muzzle-piece 101 is provided with prominent portions 101^{11} on its front end on opposite sides of the bore 101^1 used for introducing the bolt, so that the bore 101^1 remains open on two sides. In this way, a circular member 100^1 fixed firmly to the bolt 100 can be pushed conveniently into the bore 101^1 of the muzzle-piece 101 and by means of a clamping pin 102 can be held clamped in any position depending upon the particular length of the bolt. The cartridge is held locked in the cartridge position indicated by 114^{11} and the instrument is closed

again by means of upper hinges and by the sliding together and rotational locking of the front and rear parts of the instrument. By this locking arrangement the barrel jacket 106 is so rotated again by the peg 117 that it can be moved axially relative to the front part 104 of the casing.

By pressing the instrument with the prominent portions 101^{11} situated at its front end against the point of insertion after the locking operation, the muzzle-piece 101, the barrel jacket 106 connected thereto with the parts situated in its bore, as well as the sealing member 125 in the instrument casing, are pushed as far as the edge 104^{1}. Thereby the firing piston 135 with its head portion 135^{1} supports itself on the blocking member 131, so that the piston 135 is pushed backwards against the pressure of the piston spring 133, which is supported by a piston ring 136 held by a peg 137, against the guiding plate 138 and the casing tube 119. The piston spring 133 is therefore stressed and the outer spring 132 is compressed as well.

The safety catch 128 and also the blocking member 131 must be pressed in in order to liberate the charge. Since the bore 131^{1} is displaced correspondingly, the firing piston 135 can spring forward along the bore 131^{2} against the percussion bolt 122, thus igniting the propellant. The gases produced by the explosion flow through the channels 110^{11} in the space between the barrel 110 and the barrel jacket 106, after the driving piston 108 has moved forwards through the length of the peg 114^{1} of the cartridge support 114, and then flow into the adjacent space 106^{1111}. After the withdrawal of the instrument from the place of insertion, the outer spring 132 pushes the movable parts of the instrument into their initial positions again. The safety ring 139 holds back the piston 135 before it reaches this end position, so that the blocking member 131 can likewise slide into its initial position again through the pressure of the spring 130.

The base of the cartridge is firmly clamped in the space 121^{1} in the member 121 holding the percussion bolt by the gas pressure. When the instrument is opened the cartridge is ejected from its position 114^{11} in the cartridge support 114. By unlocking and opening the parts of the instrument the spent cartridge is removed from its place in the member 121 holding the percussion bolt by striking against the edge 110^{111} of the rear end of the barrel.

WHAT WE CLAIM IS:—

1. An instrument for inserting bolts into fixed structures or receiving bodies which comprises a piston which is movably guided within a barrel along the longitudinal axis of the instrument and which is arranged to be thrust forward by combustion gases produced by a cartridge, in which the forward end of the piston is arranged for contact with a bolt which is received into a muzzle-piece of the instrument and the rear end of the piston is provided with a pressure chamber into which a hollow prominent portion of a cartridge support which is mounted in the rear part of the barrel projects, and in which the cartridge support with its prominent portion is displaceable longitudinally relative to the muzzle-piece which is adapted to receive the bolt to be inserted.

2. An instrument according to claim 1, in which the cartridge support has its axial movement limited by a hollow nut located at the rear part of the barrel and is pushed by the gas pressure generated in the pressure chamber into its rear initial position in the hollow nut, the cylindrical guideway for the piston in the barrel extending over a length of several piston diameters.

3. An instrument according to claim 1 and 2, in which the muzzle-piece of the instrument is constructed as an adjustable casing provided with a slot for observing the position of the bolt at the forward end of the piston and with an enlarged bore for receiving a circular support on the bolt to be inserted, said muzzle-piece being axially adjustable relative to the barrel and fixable thereto, for example, by means of a screw-thread having a length corresponding to the maximum length of bolt which may be inserted.

4. An instrument according to claim 1, in which the cartridge support is firmly connected to the rear part of the barrel and said barrel is able to move longitudinally in a barrel casing as well as being under the influence of a spring which holds the barrel and the cartridge support in a constant rear firing position for any length of bolt.

5. An instrument according to claim 4, in which the muzzle-piece of the instrument is axially adjustable relative to the barrel casing and is fixable thereto, for example by means of a screw-thread, for the purpose of receiving bolts of different lengths.

6. An instrument according to claims 1 and 4, in which the piston is movably guided in the muzzle-piece and has its rear part containing the pressure chamber arranged to project into a gas exit space formed in the barrel.

7. An instrument according to claim 6, in which a muzzle cap is fitted to the muzzle-piece which is connected to the barrel casing by means of a bayonet or like connection, said muzzle cap having two prominent slotted jaws provided with lateral recesses, and said bolt to be inserted being provided with a circular support which is inserted and held between said two slotted jaws.

8. An instrument according to claims 1

and 4, in which the barrel surrounding the piston and located in the front part of the instrument casing has a limited axial movement and is connected to a sealing member by rotating the front part of the casing relative to the rear part of the casing connected to it by a hinged joint, said sealing member being provided with a firing piston which can be blocked by a blocking member and a piston spring which is stressed by placing the instrument against the place of insertion, which thus causes a relative displacement between the muzzle-piece, the barrel and the sealing member on the one hand, and the parts of the casing which are connected to one another by the hinged joint on the other hand.

9. An instrument according to claim 8, in which the barrel is biased away from the muzzle-piece and is mounted displaceably and non-rotatably in a barrel jacket which is connected to the muzzle-piece and has a limited axial movement in the front part of the casing.

10. An instrument according to claims 8 and 9, in which an L-shaped guide-way is provided around the circumference of the barrel jacket as a locking means for a guiding bolt fixed to the front part of the casing, so that the barrel jacket is unable to move axially in the front part of the casing when the instrument is open or broken open.

11. An instrument according to any of claims 8 to 10, in which a bayonet or screw-thread connection serves as a rotatable fastening between the front part of the casing and the rear part of the casing on the one hand, and between the barrel and the sealing member on the other hand, whereby the hinged joint between the front part of the casing and the rear part of the casing is formed from pegs arranged on each side of a prominent flange on the rear part of the casing, said pegs being adapted to grip behind a collar situated at the rear end of the front part of the casing, and said collar having a slot which is wide enough for said flange to pass through after breaking open the rear part of the casing.

12. An instrument according to one or more of claims 8 to 11, in which the muzzle-piece is screwed on to the barrel jacket by the interconnection of a riveted ring which limits forward movement, and in which the muzzle-piece has on its front end two prominent portions extending one on each side of the bolt guiding channel, one of said prominent portions being provided with a clamping pin or tube in an axial bore formed therein which projects partially into the bolt guiding channel, said clamping pin allowing both a circular support fitted on the bolt and also the front end of the piston having a recess for holding the bolt to be maintained in different positions.

13. A bolt-inserting instrument, substantially as hereinbefore described and with reference to Fig. 1, Fig. 2, Figs. 3—5 or Figs. 6—10 of the accompanying drawings.

POLLACK, MERCER & TENCH,
Chartered Patent Agents,
Audrey House, Ely Place,
London, E.C.1,
Agents for the Applicants.

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1002292 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

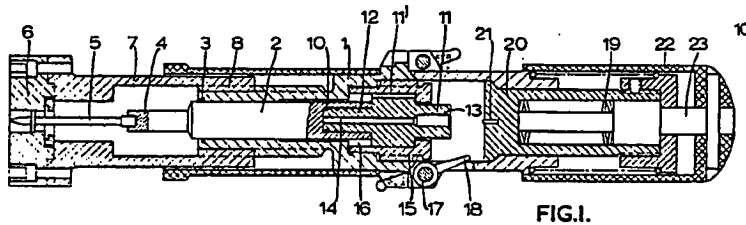


FIG.1.

FIG.8.

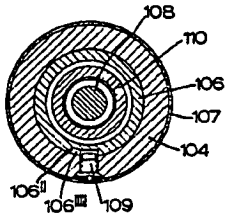


FIG.9.

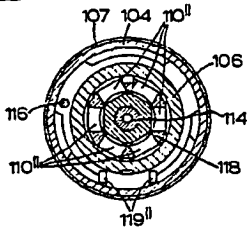
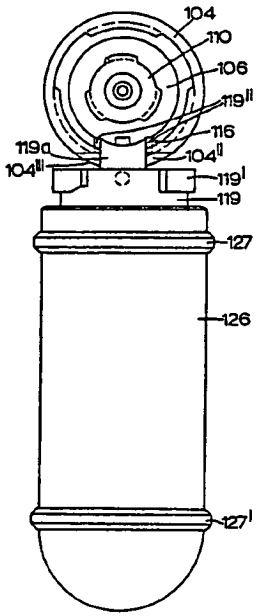


FIG.10.



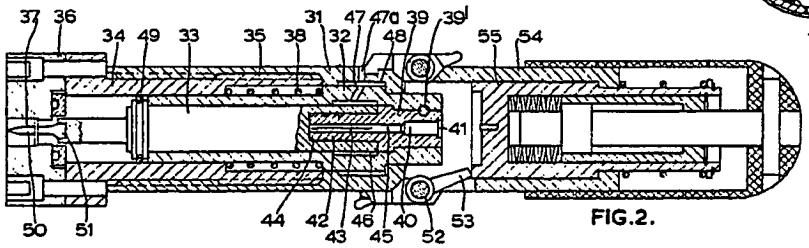


FIG.2.

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Sheet 2

FIG.6.

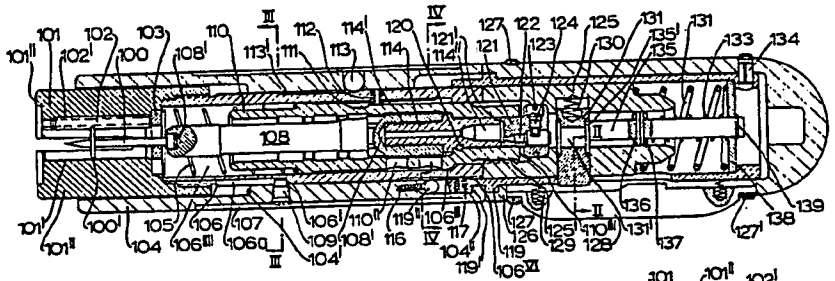

FIG.3.

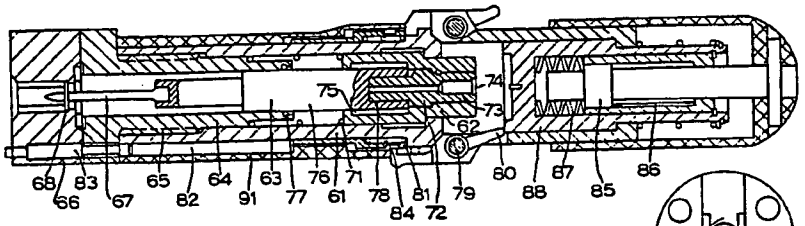

FIG.7.

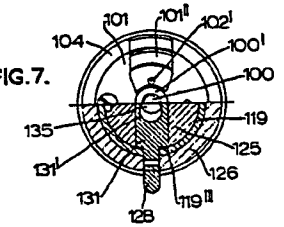

FIG.4.

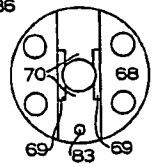

FIG.5.